CLAIMS

What is claimed is:

1. A power generation system, comprising:

a DC bus;

a turbogenerator including a motor/generator and a turbine coupled to a common shaft, said turbogenerator to generate AC power;

a first power converter coupled to the turbogenerator and the DC bus, said first power converter to convert said AC power to DC power on said DC bus;

a second power converter coupled to the DC bus and for coupling to a load, said second power converter to convert said DC power on said DC bus to an output power for applying to the load;

a battery coupled to the DC bus;

a capacitor coupled to the DC bus to source power to and sink power from the DC bus, due to load changes, to stabilize a DC voltage on the DC bus; and

a power controller coupled to the turbogenerator and the first and second power converters, said power controller to regulate a speed of the turbine, independent of the DC voltage on the DC bus.

2. The power generation system of claim 1 wherein the DC bus and the first and second power converters are contained within the power controller.

3. The power generation system of claim 1 further comprising a third power converter coupled between the DC bus and the capacitor, said power

controller to controllably couple the capacitor to the DC bus via the third power converter.

4. The power generation system of claim 3 wherein the battery is controllably coupled to the DC bus via said third power converter.

5. The power generation system of claim 3 further comprising a fourth power converter coupled between the DC bus and the battery, said power controller to controllably couple the battery to the DC bus via the fourth power converter.

6. The power generation system of claim 1 wherein the capacitor is at least one of an electrochemical capacitor and a hybrid capacitor.

7. The power generation system of claim 1 wherein said second power converter comprises a DC/DC power converter to convert the DC voltage on the DC bus to a regulated DC output voltage for applying to the load.

8. The power generation system of claim 1 wherein said second power converter comprises a DC/AC power converter to convert the DC power on the DC bus to an AC output power having a fixed frequency for applying to the load.

9. The power generation system of claim 1 wherein when an increase in power in the load is detected, the power controller controllably couples the capacitor to the DC bus to source power to the DC bus to meet the increase in power in the load.

10. The power generation system of claim 9 wherein when the increase in power in the load is detected, the power controller increases the speed of the turbine to increase the DC power on the DC bus, and wherein when the DC power on the DC bus meets the increase in power in the load, said power controller recharges the capacitor to a predetermined level.

11. The power generation system of claim 10 wherein when a decrease in power in the load is detected, the power controller decreases the speed of the turbine to decrease the DC power on the DC bus.

12. The power generation system of claim 11 wherein the power controller controllably couples the capacitor to the DC bus to sink excess current on the DC bus.

13. The power generation system of claim 3 wherein said first and second power converters are bi-directional, said power controller, in a startup mode, to (i) disable the second power converter to isolate the DC bus from the load, (ii) configure the third power converter to couple the capacitor to the DC bus and

provide a startup DC power on the DC bus, and (iii) configure the first power converter to convert the startup DC power on the DC bus to a startup AC power to start the motor/generator.

14. The power generation system of claim 13 further comprising a battery controllably coupled to the capacitor to charge the capacitor to allow said capacitor to start the motor/generator during a startup mode.

15. The power generation system of claim 1 wherein the turbogenerator further comprises:

a generator, coupled to the common shaft, to generate the AC power;

a compressor, coupled to the common shaft, to provide a supply of compressed air;

a combustor coupled to receive the supply of compressed air and the fuel, said combustor to combust the fuel and to provide exhaust gas;

the turbine coupled the common shaft and coupled to receive the exhaust gas, said exhaust gas to flow through the turbine to control a rotational speed of the common shaft; and

a recuperator including a high pressure side coupled between the compressor and the combustor, and a low pressure side coupled to receive the exhaust gas from the turbine.

16. A power generation system, comprising:

a fuel source to provide fuel;

a turbogenerator, coupled to the fuel source, to generate AC power;

a power controller, electrically coupled to the turbogenerator, including first and second power converters, said first power converter to convert said AC power to DC power on a DC bus, and said second power converter to convert said DC power on said DC bus to an output power for coupling to a load, said power controller to regulate the fuel to the turbogenerator, independent of a DC voltage on the DC bus;

a capacitor controllably coupled to the DC bus; and

a battery controllably coupled to the DC bus;

17. The power generation system of claim 16 wherein the capacitor to source power to and sink power from the DC bus, due to load changes, to stabilize the DC voltage on the DC bus.

18. The power generation system of claim 16 wherein the capacitor and the battery to stabilize the DC voltage on the DC bus during transients.

19. The power generation system of claim 16 further comprising a third power converter coupled between the DC bus and the capacitor, said power controller to controllably couple the capacitor to the DC bus via the third power converter.

20. The power generation system of claim 19 wherein the battery is coupled across the capacitor by a switch, said one or both of the capacitor and the battery being controllably coupled to the DC bus via one or both of the third power converter and the switch.

21. The power generation system of claim 19 wherein the third power converter is contained within the power controller.

22. The power generation system of claim 19 further comprising a fourth power converter coupled between the DC bus and the battery, said power controller to controllably couple the battery to the DC bus via the fourth power converter.

23. The power generation system of claim 16 wherein the capacitor is at least one of an electrochemical capacitor and a hybrid capacitor.

24. The power generation system of claim 16 wherein said second power converter comprises a DC/DC power converter to convert the DC voltage on the DC bus to a regulated DC output voltage for coupling to the load.

25. The power generation system of claim 16 wherein said second power converter comprises a DC/AC power converter to convert the DC power on the DC bus to an AC output power having a fixed frequency for coupling to the load.

26. The power generation system of claim 16 wherein when an increase in the load is detected, the power controller controllably couples the capacitor to the DC bus to source power to the DC bus to meet the increase in the load.

27. The power generation system of claim 26 wherein when the increase in the load is detected, the power controller increases the fuel to the turbogenerator to increase the DC power on the DC bus, and wherein when the DC power on the DC bus meets the increase in the load, said power controller recharges the capacitor to a predetermined level and then decouples the capacitor from the DC bus.

28. The power generation system of claim 27 wherein when a decrease in the load is detected, the power controller decreases the fuel to the turbogenerator to decrease the DC power on the DC bus, and controllably couples the capacitor to the DC bus to absorb any excess current on the DC bus.

29. The power generation system of claim 19 wherein said first and second power converters are bi-directional, said power controller, in a startup mode, to (i) disable the second power converter to isolate the DC bus from the load, (ii) configure the third power converter to couple the capacitor to the DC bus and provide a startup DC power on the DC bus, and (iii) configure the first power converter to convert the startup DC power on the DC bus to a startup AC power to start the motor/generator.

30. The power generation system of claim of claim 16 wherein the turbogenerator comprises:

a shaft;

a generator, coupled to the shaft, to generate the AC power;

a compressor, coupled to the shaft, to provide a supply of compressed air;

a combustor coupled to receive the supply of compressed air and the fuel, said combustor to combust the fuel and to provide exhaust gas;

a turbine coupled the shaft and coupled to receive the exhaust gas, said exhaust gas to flow through the turbine to control a rotational speed of the shaft; and

a recuperator including a high pressure side coupled between the compressor and the combustor, and a low pressure side coupled to receive the exhaust gas from the turbine.

31. The power generation system of claim 30 further comprising a temperature sensor coupled to the power controller and the turbine to sense a temperature, said power controller to vary the supply of fuel to the combustor to control the temperature, said control of the temperature being independent of the DC voltage on the DC bus.

32. A power generation system, comprising:

a turbogenerator including a motor/generator and a turbine coupled to a common shaft, said turbogenerator to generate AC power;

first power converter means, coupled to the turbogenerator, for converting said AC power to DC power on a DC bus;

second power converter means, coupled to the DC bus, for converting said DC power on said DC bus to an output power for coupling to a load;

power source means controllably coupled to the DC bus;

capacitor means controllably coupled to the DC bus;

third power converter means, coupled between the capacitor means and the DC bus; and

power controller means, coupled to the turbogenerator and the first, second, and third power converter means, for controllably coupling the power source means and the capacitor means to the DC bus to stabilize a DC voltage on the DC bus during transients, and for regulating a speed of the turbine, independent of the DC voltage on the DC bus.

33. The power generation system of claim 32 wherein the battery is controllably coupled to the DC bus via said third power converter means and alternatively via a fourth power converter means.

34. The power generation system of claim 32 wherein when an increase in power in the load is detected, the power controller means controllably couples the capacitor to the DC bus to source power to the DC bus to meet the increase in power in the load.

35. The power generation system of claim 34 wherein when the increase in power in the load is detected, the power controller means increases the speed of the turbine to increase the DC power on the DC bus, and wherein when the DC power on the DC bus meets the increase in power in the load, said power controller means recharges one or both of the capacitor means and the power source means.

36. The power generation system of claim 35 wherein when a decrease in power in the load is detected, the power controller means decreases the speed of the turbine to decrease the DC power on the DC bus.

37. The power generation system of claim 32 wherein said power controller means, in a startup mode, for (i) disabling the second power converter means to isolate the DC bus from the load, (ii) configuring the third power converter means to couple the capacitor means to the DC bus and provide a startup DC power on the DC bus, and (iii) configuring the first power converter means to convert the startup DC power on the DC bus to a startup AC power to start the motor/generator.

38. The power generation system of claim 37 wherein the power controller means for controllably coupling the power source means across the capacitor means to charge the capacitor to allow said capacitor to start the motor/generator during the startup mode.

39. The power generation system of claim 32 wherein the turbogenerator further comprises:

a generator, coupled to the common shaft, to generate the AC power;

a compressor, coupled to the common shaft, to provide a supply of compressed air;

a combustor coupled to receive the supply of compressed air and the fuel, said combustor to combust the fuel and to provide exhaust gas;

the turbine coupled the common shaft and coupled to receive the exhaust gas, said exhaust gas to flow through the turbine to control a rotational speed of the common shaft; and

a recuperator including a high pressure side coupled between the compressor and the combustor, and a low pressure side coupled to receive the exhaust gas from the turbine.